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Morphological variation and geographical distribution of *Luetkenotyphlus brasiliensis* (Gymnophiona: Siphonopidae)

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Abstract

Morphological variation and geographical distribution of *Luetkenotyphlus brasiliensis* (Gymnophiona: Siphonopidae). The geographical distribution of *Luetkenotyphlus brasiliensis* is reviewed based on data from the literature and examination of specimens recently collected in Brazil. We also provide new information on variation of the vomerine diastema, and meristic and morphometric data for *L. brasiliensis* based on Brazilian specimens.

Keywords: Brazil, caecilian, meristic data, morphometry, vomerine diastema.

Resumo

Variação morfológica e distribuição geográfica de *Luetkenotyphlus brasiliensis* (Gymnophiona: Siphonopidae). A distribuição geográfica de *Luetkenotyphlus brasiliensis* é revisada com base em dados de literatura e análise de espécimes recentemente coletados no Brasil. Informações inéditas sobre a variação do diastema vomeriano, dados merísticos e morfométricos para *L. brasiliensis* são fornecidas a partir da análise dos espécimes brasileiros.

Palavras-chave: Brasil, cecília, dados merísticos, diastema vomeriano, morfometria.

Introduction

Luetkenotyphlus Taylor, 1968 is a monotypic genus of Gymnophiona established to accommodate *Siphonops brasiliensis* Lütken, 1851, by original designation. The diagnosis proposed by Taylor (1968) includes the following characters: anterior terminal shield well defined; eyes in sockets that are closer to tentacular apertures than to nostrils; premaxillary-maxillary series of teeth reduced; splenial teeth absent; 131 primary annuli; secondary grooves absent; scales absent. Taylor (1968) described *S. confusionis* to accommodate other specimens previously assigned to *S.*

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brasiliensis. However, Nussbaum (1986) interpreted the holotype of *S. confusionis* as a juvenile *L. brasiliensis* and placed *S. confusionis* as a junior synonym of *L. brasiliensis*. Based on Wilkinson and Nussbaum (2006), a short series of premaxillary-maxillary teeth that does not extend posterior to the level of the choanae, along with the presence of an anterior diastema in the vomerine teeth in adults distinguishes *Luetkenotyphlus* from *Siphonops*. Surprisingly, the most recent diagnosis of *Luetkenotyphlus brasiliensis* presented by Wilkinson *et al.* (2011) disregarded the vomerine diastema without comment.

Since the description of *Luetkenotyphlus brasiliensis* based on a single specimen from "Brazil," few specimens have been reported in the literature. Ihering (1911) cited the occurrence of this species in the states of Minas Gerais and São Paulo in southeastern Brazil, but no voucher specimens were reported. Dunn (1942) cited 21 specimens from south and southeastern Brazil, housed at seven herpetological collections. A record of *L. brasiliensis* from Argentina (Heer and Lanari 1998) is based on a single specimen collected on September 1947. Nussbaum (1986) cited records from Paraguay, based on two specimens collected between 1980 and 1982 (A. Schmitz pers. comm.). The conservation status of *L. brasiliensis* is unknown, and currently is defined as Data Deficient on the IUCN red list globally (IUCN 2011), as well as nationally for Paraguay (Motte *et al*. 2009), Argentina (Lavilla 2001), and the Brazilian states of Minas Gerais (Feio *et al*. 2008), São Paulo (Garcia *et al.* 2009) and Paraná (Mikich and Bérnils 2004).

Herein we review the geographic distribution of *Luetkenotyphlus brasiliensis* based on data from the literature, and from specimens housed at Brazilian zoological collections. We provide information on meristic and morphometric variation and discuss the vomerine diastema for Brazilian specimens. A photograph of a living individual of the species also is provided.

Materials and Methods

We (TM and AOM) have examined the most representative Brazilian collections for specimens of caecilians. Fifteen specimens of *L. brasiliensis* were found in three zoological collections—Museu de Zoologia João Moojen, Universidade Federal de Viçosa, Minas Gerais (MZUFV); Museu de História Natural Capão da Imbuia, Paraná (MHNCI); and Universidade Estadual Paulista, Campus de Rio Claro, Coleção "Célio F. B. Haddad," São Paulo (CFBH). All specimens were sexed by direct observation of the gonads and/or the *musculus retractor cloacae* (of males).

We include literature records and new Brazilian locations reported here to illustrate the geographic distribution for *L. brasiliensis*. However, we cannot vouch for the taxonomic veracity of the literature records. We used geographic coordinates of the municipal seat of the municipality adopted by the Instituto Brasileiro de Geografia e Estatística (IBGE) (SISCOM 2011) and gazetteer publications (e.g., Paynter Jr. and Traylor-Jr 1991) when necessary.

Results

Historical Records

The first record of *Siphonops brasiliensis* is known to be from "Brasilien" or Brazil, as reported in its description by Lütken (1851). Subsequently, Ihering (1911) stated that the species inhabits the states of Minas Gerais and São Paulo. In the latter state, the taxon is known from the localities of Franca and Rio Feio, a tributary of upper Rio Paraná, up the Rio Batalha, near the municipality of Presidente Alves (Paynter-Jr and Traylor-Jr 1991). However, no voucher specimens were reported by Ihering.

Three decades later, Dunn (1942) reported 21 specimens from south and southeastern Brazil. The data associated with the vouchers document collection dates between the end of nineteenth

century and the first half of the twentieth century (A. Schmitz [MHNH], C. McCarthy [BMNH], H. Zaher and C. Mello [MZUSP], H. Grillitsch [NHNW], J. Hallermann [ZMH], J. Rosado [MCZ], L. Acker (SMF), M. Gomes [MNRJ], pers. comm.; Appendix I). The data associated with some specimens deposited at MCZ cited by Dunn (1942) have typographical errors—e.g., MCZ 24826 and MCZ 24829 are catalogue numbers for two frogs cataloged as *Hyla* sp. The specimen MCZ 2482 reported by Nussbaum (1986) is the holotype of *S. confusionis* (now in the synonymy of *L. brasiliensis*) (J. Rosado, pers. comm.). Other specimens cited by Dunn (1942) that lack a catalogue number were checked with the help of current curators of the relevant collections (Appendix I).

Taylor (1973) commented that the collector of the holotype of *Siphonops brasiliensis* was "Dr. Langgaard" from "São Paulo." We think that this person is Dr. Theodoro Johanis Henrique Langgaard (1813–1883), an European doctor who had been based in Brazil since 1842, living in the interior of São Paulo, in the cities of Iperó and Sorocaba (1842–1865), and Campinas (1865–1870). Subsequently, he lived in the municipality of Rio de Janeiro (1870–1883), state of Rio de Janeiro, where he died (Menezes 1978). Because Dr. Langgaard may have received specimens from other regions in the interior of São Paulo state, we cannot affirm that the municipalities of Sorocaba or Iperó would be the type locality of *L. brasiliensis*.

Based on compiled records of *Luetkenotyphlus brasiliensis* (Figure 1), the geographic distribution of this species is mainly associated with the ecorregion of Tropical and Subtropical Moist Broadleaf forests (Olson *et al*. 2001) from eastern Brazil to northeastern Argentina, reaching transition areas with the Cerrado biome (Points 1, 2, and 4 in Figure 1). Two of the specimens examined here were found alive in the Serra do Brigadeiro State Park (20º43'19" S; 42º28'43" W, datum SAD1969, 1350 m elevation), captured by MRM and RNF after a heavy rain, at about 20:00 h on 19 October 2009 and 18:30 h on 09 December 2009. All other records are based on specimens previously housed in Brazilian herpetological collections and inspected by TM and AOM.

Morphological Variation

Little morphological variation was found among 15 specimens examined of *Luetkenotyphlus brasiliensis* from seven Brazilian municipalities in four States (Table 1). Nevertheless, an apparent sexual dimorphism was noted when adult males and females with similar total lengths were compared. Males have a larger body and head than females (Figure 2); the morphometric data clearly demonstrate this (Table 1). We also noted a possible indication of geographic variation in size, with individuals from eastern Minas Gerais state being larger than those from other populations (Table 1). In MNHCI 3147 and 3528, the primary grooves are slightly incomplete dorsally. Eyes are visible externally in most specimens, except MHNCI 5508, 6364, and CFBH 2498; in MZUFV 10214 only the right eye is visible. MNHCI 6382 is dehydrated and MZFV 4617 was identified as a juvenile female; it lacks developed gonads, as well as the *musculus retractor cloacae*, which is present in males. The number of primary annuli in *L. brasiliensis* ranges from 119–138 and there is no apparent sexual dimorphism in this character (Table 1).

All specimens have a short series of premaxillary-maxillary teeth that does not extend posterior to the choanae (the diagnostic character of the genus proposed by Wilkinson and Nussbaum 2006), and the tongue is smooth and attached anteriorly to the mandibular mucosa behind the dentary teeth. Four (all from municipality of Araponga, state of Minas Gerais) of the fifteen specimens examined have an anterior diastema between the right and left series of vomerine teeth. Two specimens (MZUFV 10214, 10215; both adult males with total lengths of 320 and 270 mm, respectively) have another diastema within the right and left vomerine series, between the first and the second

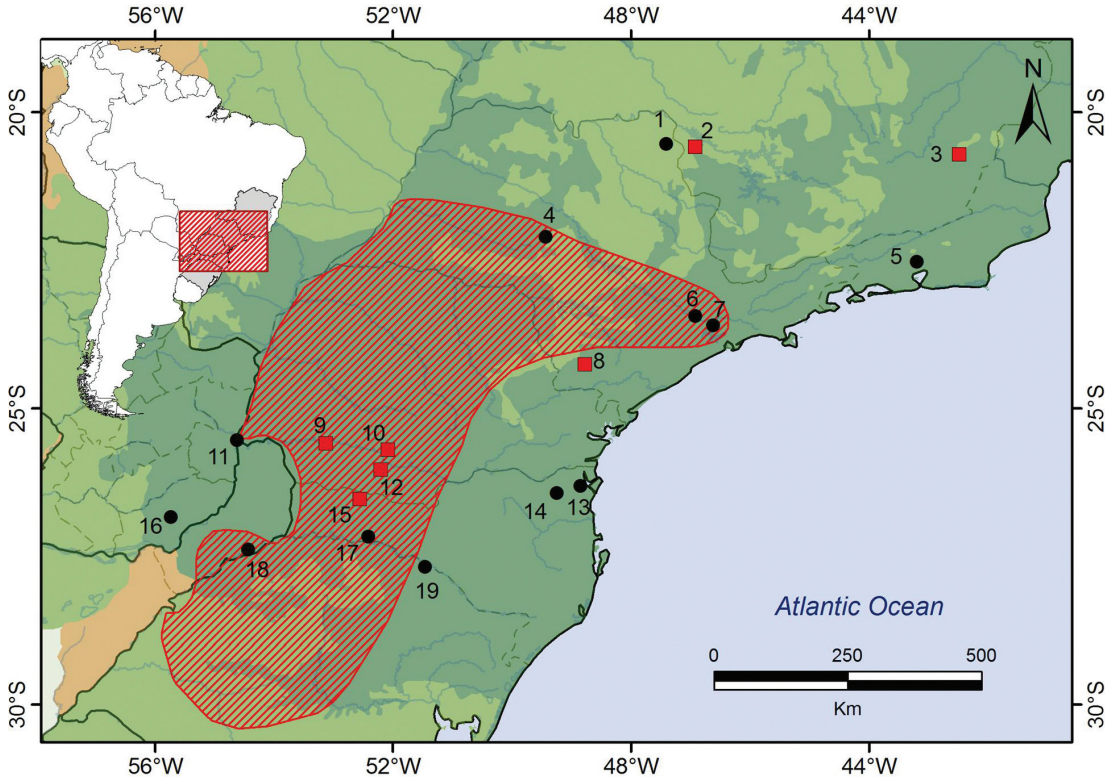

Figure 1. Geographic distribution of *Luetkenotyphlus brasiliensis*. New records (red square), Literature records (black circle). Hatched area corresponds to the distribution presented in IUCN (2011). Localities: 1. Franca; 2. Cássia; 3. Araponga (Serra do Brigadeiro State Park); 4. Rio Feio (near Presidente Alves); 5. Petrópolis; 6. Santana de Parnaíba; 7. Ipiranga; 8. Ribeirão Branco; 9. Cruzeiro do Iguaçu; 10. Foz do Jordão; 11. Ciudad del Este; 12. Mangueirinha; 13. Joinville; 14. Corupá; 15. São Domingos; 16. Pastoreo; 17. Nova Teutônia; 18. Puerto Londero; 19. Batalhão. The red rectangle in the inset map is South America shows the enlarged area of the map.

tooth; there are no empty sockets or teeth covered by mucosa. A female (MZUFV 2974) and an immature male (MZUFV 3941; Figure 3) have a well-defined anterior diastema between the vomerine series. All other specimens (MHNCI 3147, MHNCI 3528, MHNCI 5508, MHNCI 6364, MHNCI 6382, MZFV 4617, MZFV 4618, MZFV 4656, CFBH 2498, CFBH 3851, and CFBH 3852) lack a diastema. In some specimens (e.g., MHNCI 3147, 3528), a median tooth is present between the right and left vomerine series. Some intact or broken teeth hidden under mucosa in the anterior margin of the vomerine series may lead to misinterpretations about the presence of the diastema (e.g., MHNCI 5508; CFBH 3851).

In life, *Luetkenotyphlus brasiliensis* is uniform lavender dorsally and ventrally, except for the head, which is paler both dorsally and ventrally. The lips and region surrounding the vent can be whitish (Figure 3) or pinkish (Figure 4). Preserved specimens are grayish or brownish. Annular grooves on the sides of the body may be slightly darker than the general body color.

Table 1. Morphometric (mm) and meristic data for Brazilian specimens of *Luetkenotyphlus brasiliensis*.

Municipality, State:	Araponga, MG				Cássia, MG			Cruzeiro do Iguaçu, PR	Foz do Jordão, PR			Mangueirinha, PR	Ribeirão Branco, SP	São Domingos, SC	
Collection:	MZUFV				MZUFV		MHNCI	MHNCI	MHNCI			MHNCI	CFBH	CFBH	
Specimen No.:	2974	3941	10214	10215	4617	4618	4656	3528	3147	5508	6364	6382	2498	3852	3851
Sex, maturity (M = mature; J = juvenile)	♀, M	♂, J	♂, M	♂, M	♀, J	♂, J	♂, M	♀, M	♀, M	♀, M	♀, M	♀, M	♀, M	♂, M	♂, M
Total length	260	117	320	270	125	115	205	280	300	255	250	290	238	238	205
Head width at jaw articulation	5.8	3.9	6.7	6.6	2.9	4.0	4.1	4.7	4.9	4.1	4.1	4.2	4.1	4.6	4.2
Head width at level of nostrils	2.9	1.9	4.0	3.3	2.0	1.9	2.0	2.9	2.6	2.9	2.9	2.1	3.3	3.9	3.6
Head length	7.4	4.7	8.2	8.1	5.0	2.8	6.3	6.5	7.0	7.0	7.0	6.6	6.1	6.5	6.6
Head height at level of jaw articulation	4.3	2.6	6.0	5.4	2.1	2.1	3.2	3.2	3.5	3.1	3.1	3.3	3.0	3.2	3.0
Snout projection beyond mouth	1.8	1	2.3	2.2	1.3	1.1	1.5	1.2	1.5	1.5	1.6	1.5	1.3	1.6	1.4
Body width at midbody	7.5	3.4	6.9	6.6	2.9	3	4.5	5.5	5.8	5.5	4.4	4.8	5.3	5.8	4.8
Body width at five folds anterior to vent	6.3	2.9	6.6	6.5	2.5	2.6	3.9	5.0	5.0	4.9	4.1	3.9	5.0	4.5	4.8
Body height at midbody	6.3	2.7	6.2	7.5	2.0	2.2	3.7	5.0	4.1	3.8	3.0	3.2	3.8	3.1	3.0
Internarial distance	2	1.4	2.3	2.2	1.1	1.1	1.5	2.0	1.9	2.0	1.6	2.0	2.0	1.9	2.0
Nostril–margin of the mouth distance	1.3	0.7	2.0	1.6	1.0	0.9	1.1	1.3	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Tentacle–nostril distance	2	1.3	3.2	2.3	1.6	1	2.2	2.0	2.0	2.0	2.2	2.0	2.1	1.6	1.9
Tentacle–margin of the mouth distance	0.5	0.4	0.9	0.7	0.3	0.3	0.5	0.5	0.8	0.5	0.5	0.8	0.8	0.7	0.5
Tentacle–angle jaw distance	2.5	1.4	2.6	2.0	1.3	1	1.5	2.1	2.0	2.1	2.0	2.1	2.5	1.9	2.5
Primary annuli	127	127	127	121	126	119	120	135	135	138	136	134	125	126	128
Premaxillary-maxillary teeth	11	11	12	12	11	14	14	14	14	12	13	14	12	13	13
Vomeropalatine teeth	13	13	19	16	14	14	20	23	20	16	16	20	20	19	17
Dentary teeth	15	15	20	14	16	14	19	14	17	17	14	18	16	15	17
Vomerine diastema (+ = present; – = absent)	+	+	+	+	–	–	–	–	–	–	–	–	–	–	–
Ratio of length to width at midbody	34.6	34.4	46.4	40.9	43.1	38.3	45.6	50.9	51.7	46.4	56.8	60.4	44.9	41.0	42.7

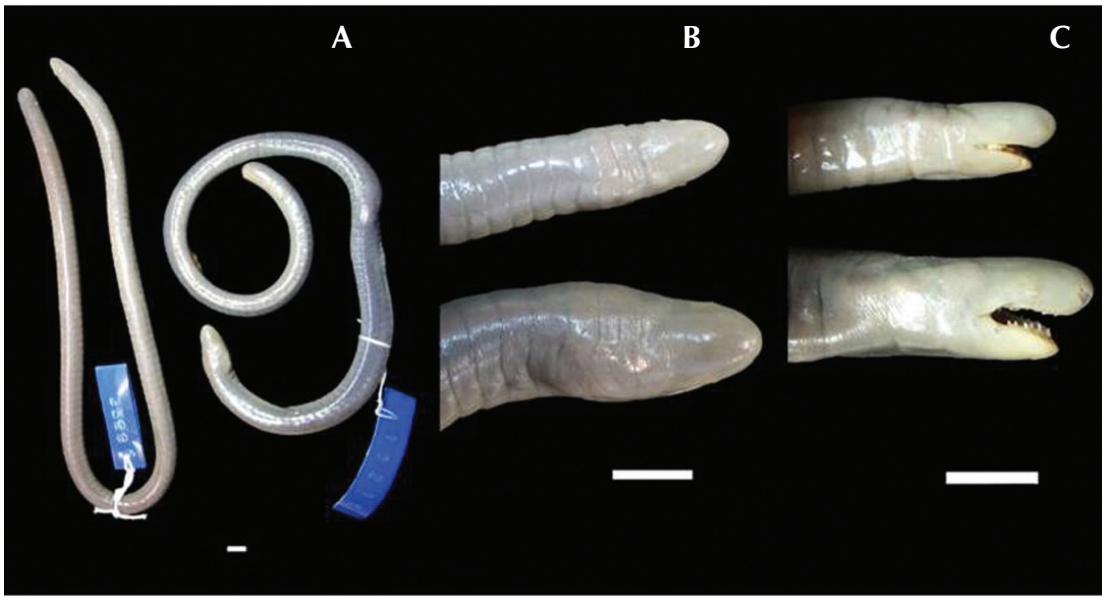

Figure 2. A female (MHNCI 3528, TL 280 mm) and a male (MZUFV 10215, TL 270 mm) *Luetkenotyphlus brasiliensis* with similar total lengths. (**A**) Female on the left; male on the right. (**B** and **C**) Female on the top and male on the bottom. General aspect, dorsal and lateral views respectively. Note the head proportions. Scale bars = 5 mm.

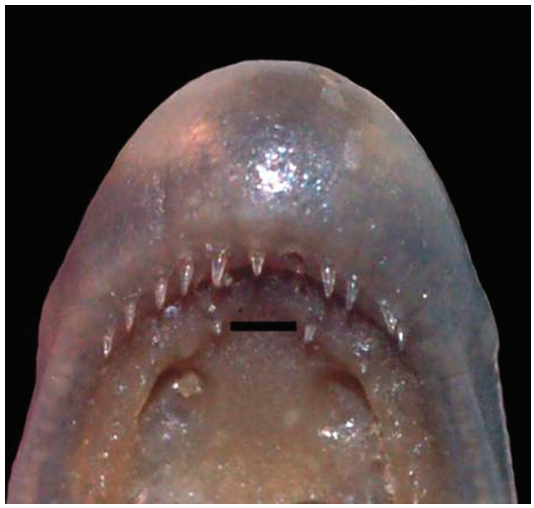

Figure 3. Palatal region of a juvenile specimen of *Luetkenotyphlus brasiliensis* with 117 mm of total length (MZUFV 3941). Vomerine diastema represented above by the black bar.

Discussion

Luetkenotyphus brasiliensis currently is categorized as Data Deficient in the state of Minas Gerais (Feio *et al*. 2008), although there is no official record of this species in this Brazilian state. Ihering (1911) cited *L. brasiliensis* as occurring in Minas Gerais, but no voucher specimen was identified. Dunn (1942) reported three specimens (ZMH A00249-A00251) from southern Brazil. However, the catalogue data for these specimens indicate that they were collected from the mountains between states of Espírito Santo and Minas Gerais, Brazil (J. Hallermann, pers. comm.), probably referring to the northern portion of Serra da Mantiqueira, which is located in the boundary between these two Brazilian states. The presence of this species in the municipalities of Araponga (at the Serra do Brigadeiro State Park) and Cássia are new,

Figure 4. (**A**) General aspect of *Luetkenotyphlus brasiliensis* (MZUFV 10214) in life. (**B**) Detail of the head.

vouchered records of *L. brasiliensis* in Minas Gerais. Serra do Brigadeiro mountain, where Serra do Brigadeiro State Park is located, corresponds to northwest region of the Serra da Mantiqueira mountain range, also corresponding to the highest elevation from which the genus is known (i.e., 1350 m). Most records of *Luetkenotyphlus* are from lower-elevation regions, usually less than 500 m (IUCN 2011).

Like many other caecilians, little is known about the geographic distribution of *Luetkenotyphlus brasiliensis*. Most species are fossorial and hard to find; consequently, many are only known from relatively few specimens and localities (Ávila-Pires *et al*. 2010). In fact, 30% of caecilian taxa from Brazil are known only from their types. Save for the specimens collected in Minas Gerais, we obtained all other *L. brasiliensis*, while a hydroelectric powerplant dam was being filled. Many new fossorial taxa have been described in the last decade as a result of faunal rescue efforts when reservoirs are filled (Mott *et al.* 2008, Maciel *et al.* 2009, Strüssmann and Mott 2009). It is alarming to think that such terrestrial habitats are now flooded and that populations of organisms, at best, suffered local reductions if they did not become extinct.

Our discovery of an anterior diastema between the right and left series of vomerine teeth in a juvenile specimen is incongruent with the diagnoses of *Luetkenotyphlus* presented by Nussbaum (1986) and Wilkinson and Nussbaum (2006). Moreover we have demonstrated sexual dimorphism, as well geographical variation, in size in *L. brasiliensis*. Sexual dimorphism in head size (males having wider heads than females) has been reported in other siphonopid genera such as *Brasilotyphlus guarantanus* (Maciel *et al*. 2009), and *Microcaecilia taylori* (Maciel and Hoogmoed 2011); thus, it seems widespread among caecilians (Kupfer 2009). Although Nussbaum (1986) did not find evidence for sexual dimorphism in the five individuals of *L. brasiliensis* that he examined, we did in our larger sample, but unfortunately, our sample size was insufficient to allow us to conduct statistical analyses. Additionally, we find larger morphometric values for specimens from Araponga (same specimens which presented the vomerine diastema) in relation to specimens from other populations; geographic variation in size has not been reported in any siphonopid. Further, our observation of a vomerine diastema in a diminutive, immature specimen (MZUFV 3941) differs from that of Nussbaum (1986), who inferred an appearance of the diastema late in the ontogeny of *Luetkenotyphlus*. Although we have some indication of variability in this character,

we refrain from making further speculations before examining more specimens.

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References

Ávila-Pires, T. C. S., M. S. Hoogmoed, and W. A. Rocha. 2010. Notes on the Vertebrates of northern Pará, Brazil: a forgotten part of the Guianan Region, I. Herpetofauna. *Boletim do Museu Paraense Emílio Goeldi 5:* 13–112.

Dunn, E. R. 1942. The American Caecilians. *Bulletin of the Museum of Comparative Zoology 91:* 439–40.

Feio, R. N., D. L. Silvano, L. B. Nascimento, F. S. F. Leite, P. C. Eterovick, M. R. S. Pires, A. A. Giaretta, C. A. G. Cruz, A. S. Neto, and M. V. Segalla. 2008. Anfíbios Ameaçados de Extinção em Minas Gerais. CD-ROM *in* G. M. Drummond, A. B. M. Machado, C. S. Martins, M. P. Mendonça, and J. R. Stehmann (eds.), *Listas Vermelhas das Espécies de Fauna e Flora Ameaçadas de Extinção em Minas Gerais*. 2nd ed. Belo Horizonte, Minas Gerais. Fundação Biodiversitas.

Garcia, P. C. A., R. J. Sawaya, I. A. Martins, C. A. Brasileiro, V. K. Verdade, J. Jim, M. V. Segalla, M. Martins, D. C. Rossa-Feres, C. F. B. Haddad, L. F. Toledo, C. P. A. Prado, B. M. Berneck, and O. G. S. Araújo. 2009. Anfíbios. Pp. 329–347 *in* Bressan, P. M., M. C. M. Kierulff, and A. M. Sugieda (eds.), *Fauna Ameaçada de Extinção no Estado de São Paulo: Vertebrados*. São Paulo. Fundação Parque Zoológico de São Paulo, Secretaria do Meio Ambiente.

Heer, T. and L. Lanari. 1998. Geographic distribution: *Lutkenotyphlus brasiliensis* (São Paulo Caecilian). *Herpetological Review 29:* 244.

Ihering, R. V. 1911. Os Amphibios do Brazil. 1ª Ordem: Gymnophiona. *Revista do Museu Paulista 8:* 89–111.

IUCN, 2011. IUCN Red List of Threatened Species. Version 2011.1. Available at http://www.iucnredlist.org. Captured on 29 July 2011.

Kupfer, A. 2009. Sexual size dimorphism in caecilian amphibians: analysis, review and directions for future research. *Zoology 112:* 362–369.

Lavilla, E. O. 2001. Amenazas, declinaciones poblacionales y extinciones en anfibios argentinos. *Cuadernos de Herpetologia 15:* 59–82.

Lema, T. and L. A. Martins (eds.). 2011. *Anfíbios do Rio Grande do Sul: Catálogo, Diagnoses, Distribuição, Iconografia.* Porto Alegre. EDIPUCRS. 196 pp.

Lütken, C. F. 1851. *Siphonops brasiliensis*, an ny Art af Ormpaddernes (Caeciliernes) Familie. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn 1851:* 52–54.

Maciel, A. O. and M. S. Hoogmoed. 2011. Taxonomy and distribution of caecilian amphibians (Gymnophiona) of Brazilian Amazonia, with a key to their identification. *Zootaxa 2984:* 1–53.

Maciel, A. O., T. Mott, and M. S. Hoogmoed. 2009. A second species of *Brasilotyphlus* (Amphibia: Gymnophiona: Caeciliidae) from Brazilian Amazonia. *Zootaxa 2226:* 19–27.

Menezes, R. O. L. 1978. *Minhas Memórias dos Outros*. Rio de Janeiro. Civilização Brasileira. 260 pp.

Mikich, S. B. and R. S. Bérnils (orgs.). 2004. *Livro Vermelho da Fauna Ameaçada no Estado do Paraná*. Curitiba. Instituto Ambiental do Paraná. 764 pp.

Mott, T., D. H. Morais, and R. A. Kawashita-Ribeiro. 2008. Reptilia, Squamata, Amphisbaenidae, *Anops bilabialatus*: distribution extension, meristic data, and conservation. *Check List 4:* 146–150.

Motte, M., K. Núñez, P. Cacciali, F. Brusquetti, N. Scott, and A. L. Aquino. 2009. Categorización del estado de conservación de los anfibios y reptiles de Paraguay. *Cuadernos de Herpetologia 23:* 5–18.

Nussbaum, R. A. 1986. The taxonomic status of *Lutkenotyphlus brasiliensis* (Lütken), and *Siphonops confusionis* Taylor (Gymnophiona: Caeciliidae). *Journal of Herpetology 20:* 441–444.

Olson, D. M., E. Dinerstein, E. D. Wikramanayake, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D'Amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, , P. Hedao, and K. R. Kassem. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. *Bioscience 51:* 933–938.

Paynter Jr., R. A. and M. A. Traylor Jr. 1991. *Ornithological Gazetteer of Brazil*. Vol. 2. Cambridge, USA. Harvard University. 789 pp.

SISCOM. 2011. Sistema Compartilhado de Informações Ambientais. Centro de Sensoriamento Remoto. URL: http://siscom.ibama.gov.br/shapes/. Captured on 17 September 2011.

Strüssmann, C. and T. Mott. 2009. Sympatric amphisbaenids from Manso Dam region, Mato Grosso State, Western Brazil, with the description of a new two-pored species of *Amphisbaena* (Squamata, Amphisbaenidae). *Studies on Neotropical Fauna and Environment 44:* 37–46

Taylor, E. H. 1968. *The Caecilians of the World: A Taxonomic Review*. Lawrence, USA. The University of Kansas Press. 848 pp.

Taylor, E. H. 1973. A caecilian miscellany. *University of Kansas Science Bulletin 50:* 183–231.

Wilkinson, M. and R. A. Nussbaum. 2006. Caecilian phylogeny and classification. Pp. 39–78 *in* J. M. Exbrayat (ed.), *Reproductive Biology and Phylogeny of Gymnophiona (Caecilians).* Vol. 5. Plymouth, U.K. Science Publishers Inc.

Wilkinson, M., D. San Mauro, E. Sherratt, and D. J. Gower. 2011. A nine-family classification of caecilians (Amphibia: Gymnophiona). *Zootaxa 2874:* 41–64.

Appendix I. Specimens of *Luetkenotyphlus brasiliensis* cited in literature and/or examined in this work. Acronyms: BHNH (Natural History Museum, London, England); CFBH (Coleção Herpetológica Célio Fernando Baptista Haddad, Universidade Estadual Paulista, São Paulo, Brazil); MACN (Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina); MCT (Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul); MCZ (Museum of Comparative Zoology, Harvard University, Cambridge, EUA); MHNCI (Museu de História Natural Capão da Imbuia, Paraná, Brazil); MHNG (Muséum national d'Histoire naturelle, Paris, France); MNRJ (Museu Nacional, Rio de Janeiro, Brazil); MZUFV (Museu de Zoologia João Moojen, Universidade Federal de Viçosa, Minas Gerais, Brazil); MZUSP (Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil.); NHNW (Naturhistorisches Museum Wien, Vienna, Autria); SMF (Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt, Germany); ZMH (Zoologisches Museum Hamburg, Universität Hamburg, Hamburg, Germany); ZMUC (Zoological Museum, University of Copenhagen, Copenhagen, Denmark). Localities previously known as: 1, Colonia Hansa; 2, Pernahyba or Parnahyba; 3, Ypiranga; 4, Ciudad Presidente Stroessner. *Date determined based on date of identification or citation in published paper. – = data not available.

Voucher	Date of collection	Country	Administrative unit	Municipality	Authority
ZMUC RO 237	1842–1851*	Brazil	São Paulo	–	Lütken 1851, Taylor 1968, 1973
ZMH A00249	1899	Brazil	"South"	–	Dunn 1942
ZMH A00250	1899	Brazil	"South"	–	Dunn 1942
ZMH A00251	1899	Brazil	"South"	–	Dunn 1942
SMF 25-26	1904	Brazil	Santa Catarina	Corupá[1]	Dunn 1942
MZUSP 961	1908	Brazil	São Paulo	São Paulo[3]	Dunn 1942
MCZ 2482	1908–1909	Brazil	Rio de Janeiro	Petropolis	Nussbaum 1986
MZUSP 960	1909	Brazil	São Paulo	Franca	Dunn 1942
NHMW 9164:1	1911	Brazil	Santa Catarina	Joinville	Dunn 1942
NHMW 9164:2	1911	Brazil	Santa Catarina	Joinville	Dunn 1942
MNRJ 542	1915	Brazil	Santa Catarina	Joinville	Dunn 1942
MNRJ 840 sic 848	1915	Brazil	Santa Catarina	Joinville	Dunn 1942
ZMH A00248	≤1915*	Brazil	Santa Catarina	Corupá[1]	Dunn 1942
NHMW 9166:1	≤1929*	Brazil	São Paulo	Santana de Parnaíba[2]	Dunn 1942
NHMW 9168:1	≤1929*	Brazil	–	–	Dunn 1942
NHMW 9168:2	≤1929*	Brazil	–	–	Dunn 1942
NHMW 9165:1	≤1929*	Brazil	–	–	Dunn 1942

Appendix I. *Continued.*

Voucher	Date of collection	Country	Administrative unit	Municipality	Authority
SMF 29326-29	1937	Brazil	Santa Catarina	Nova Teutônia	Taylor 1968
BMNH 98-6-27, 3	≤1942*	Brazil	Santa Catarina	–	Dunn 1942
MNRJ 543	≤1942*	Brazil	–	–	Dunn 1942
MHNG (not found)	≤1942*	Brazil	Rio de Janeiro	Rio	Dunn 1942
MACN 9491	1947	Argentina	Missiones	Puerto Londero	Heer and Lanari 1998
MHNG 2078.99	1980	Paraguay	Itapuá	Pastoreo	Nussbaum 1986
MHNG 2108.19	1982	Paraguay	Itaipu	Ciudad del Este[4]	Nussbaum 1986
MCT 685	1989	Brazil	Rio Grande do Sul	Barracão	Lema and Martins 2011
CFBH 2498	–	Brazil	São Paulo	Ribeirão Branco	This work
MHNCI 6382	1992	Brazil	Paraná	Mangueirinhas	This work
MHNCI 5508	1996	Brazil	Paraná	Foz do Jordão	This work
MHNCI 3147	1996	Brazil	Paraná	Foz do Jordão	This work
MZUFV 2974	1997	Brazil	Minas Gerais	Araponga	This work
MHNCI 3528	1998	Brazil	Paraná	Cruzeiro do Iguaçu	This work
MZUFV 3941	2000	Brazil	Minas Gerais	Araponga	This work
MZUFV 4656	2000	Brazil	Minas Gerais	Cássia	This work
CFBH 3851	2001	Brazil	Santa Catarina	São Domingos	This work
CFBH 3852	2001	Brazil	Santa Catarina	São Domingos	This work
MZUFV 4617	2002	Brazil	Minas Gerais	Cássia	This work
MZUFV 4618	2002	Brazil	Minas Gerais	Cássia	This work
MHNCI 6364	2006	Brazil	Paraná	Foz do Jordão	This work
MZUFV 10214	2009	Brazil	Minas Gerais	Araponga	This work
MZUFV 10215	2009	Brazil	Minas Gerais	Araponga	This work